



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/059,422	01/31/2002	Nestor Alexander Bojarczuk JR.	YOR920010368US2	7372
21254	7590	10/20/2004	EXAMINER	
MCGINN & GIBB, PLLC 8321 OLD COURTHOUSE ROAD SUITE 200 VIENNA, VA 22182-3817			DOAN, THERESA T	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/059,422

Applicant(s)

BOJARCZUK ET AL.

Examiner

Theresa T Doan

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-27 and 56-78 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-27 and 56-78 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 21-26, 63-64 and 77 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

3. In claim 27, line 4, the limitation of "a smooth an epitaxial germanium layer comprising **single-crystal germanium** ...", is not supported in the original disclosure.

4. In claim 63, the limitation of "... epitaxially silicon layer comprises a **completely** epitaxial silicon layer", is not supported in the original disclosure.

5. In claim 64, the limitation of "... epitaxial germanium layer comprises a **completely** epitaxial germanium layer", is not supported in the original disclosure.

6. In claim 77, the limitation of "... epitaxial silicon layer is formed **entirely** of single-crystal silicon", is not supported in the original disclosure.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 15-17, 56, 60, 63, 65, 74 and 76-77 are rejected under 35 U.S.C. 102(b) as being anticipated by Morshed et al. (Epitaxial CeO₂ on silicon substrate...for SOI structures) of record.

Regarding claims 15, 56, 60, 63, 65 and 77, Morshed et al. disclose a semiconductor structure, comprising:

a silicon substrate (figure 2);

a crystalline oxide (CeO₂) layer comprising single-crystal oxide formed over the substrate (see figure 2 and Abstract); and

an epitaxial silicon layer comprising single-crystal silicon formed on the crystalline oxide layer (see page 339).

It should be noted that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. In re Best, 195 USPQ 430, 433 (CCPA 1977). In this case, because the single-crystal silicon layer of the prior art formed on the single-crystal oxide layer by epitaxial which is the same process as disclosed by the claimed invention, the epitaxial silicon layer of the prior art would inherently be smooth.

Art Unit: 2814

Regarding claim 16, Morshed further discloses a silicon oxide layer formed between the substrate and the crystalline oxide layer (CeO_2) from a reaction between the deposited epitaxial (CeO_2) and the silicon substrate (see Last paragraph of page 339).

Regarding claim 17, Morshed et al. disclose the crystalline oxide layer comprises an oxide of at least one of the rare earth elements.

Regarding claim 74, Morshed discloses the crystalline oxide layer is lattice-matched to silicon (see page 339).

Regarding claim 76, Morshed discloses the epitaxial silicon layer comprises a thickness in a range from 15-30 nm (see page 342).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 21-23, 27, 58, 61-62, 64, 66-67 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morshed et al. (Epitaxial CeO_2 on silicon substrate...for SOI structures) in view of Imai et al. (U.S. Pat. 5,847,419).

Art Unit: 2814

Regarding claims 21, 23, 27, 58, 61-62, 64 and 66-67, as discussed above, Morshed does not disclose that the single crystal epitaxial silicon deposited on the single crystal oxide surface is an amorphous layer or germanium layer.

However, Imai teaches the forming of an epitaxial amorphous layer 15 of silicon-germanium by CVD (figure 5D, column 8, lines 25-30 and lines 37-41) on the oxide layer 14 and then annealing to crystalline the epitaxial amorphous layer (column 8, lines 30-36). Accordingly, it would have been obvious to form the single crystal epitaxial silicon of Morshed as the crystal epitaxial amorphous layer of silicon-germanium because as taught by Imai, such crystal epitaxial amorphous layer would be used in forming a transistor channel having larger carrier mobility for providing a transistor with a higher speed (column 3, lines 4-10). It is note that the process limitations (chemical vapor deposition, deposited, a surfactant vapor and annealed) would not carry patentable weight in this claim drawn to a structure, because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

It should be noted that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. In re Best, 195 USPQ 430, 433 (CCPA 1977). In this case, because the single-crystal silicon layer of the prior art formed on the single-crystal oxide layer by epitaxial which is the same process as disclosed by the claimed invention, the epitaxial silicon layer of the prior art would inherently be smooth.

Art Unit: 2814

Regarding claim 22, Morshed further discloses a silicon oxide layer formed between the substrate and the crystalline oxide layer (CeO_2) from a reaction between the deposited epitaxial (CeO_2) and the silicon substrate (see Last paragraph of page 339).

Regarding claim 75, Morshed discloses the crystalline oxide layer is lattice-matched to silicon (see page 339).

11. Claims 20 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morshed et al. (Epitaxial CeO_2 on silicon substrate...for SOI structures) in view of Imai et al. (U.S. Pat. 5,847,419) as applied to claims 15 and 21 above and further in view of Wang et al. (6,376,337).

Morshed et al. do not disclose the forming of additional layers of crystalline oxide layer and at least one additional layer of silicon formed on the addition layer of crystalline oxide.

However, Wang et al. in figure 7 and column 9, lines 49-61 teach the forming of alternating layers of epitaxial insulator and epitaxial silicon. Accordingly, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to form the additional layers of mixed rare earth oxide and epitaxial silicon in Morshed's device structure in order to form the super-lattice device structure, as taught by Wang (column 12, lines 38-45).

Art Unit: 2814

12. Claims 18-19, 24-25, 68-70 and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morshed et al. (Epitaxial CeO₂ on silicon substrate...for SOI structures) in view of Imai et al. (U.S. Pat. 5,847,419) as applied to claims 15, 21 and 27 above and further in view of Yano et al. (6,096,434).

Morshed teaches substantially the entire claimed structure, as applied to claims 15, 21 and 27 above, except for the crystalline oxide layer comprises a mixture of oxides of different rare earth elements and yttrium.

Yano discloses (in column 17, lines 13-19) the mixed rare earth oxide containing at least one member selected from the group consisting of Y, La, Ce, Sm, Eu, Gd, etc; the rare earth in the rare earth oxide can constitute two or more rare earth elements wherein their ratio is arbitrary in order to improve the lattice matching (column 17, lines 12-19). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to substitute the mix rare earth oxide for the crystalline oxide layer in Morshed. Because the substitution of art-recognized equivalent as suggested by Yano et al. for improving the lattice matching with the substrate is within the level of ordinary skill in the art.

13. Claims 57 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morshed et al. (Epitaxial CeO₂ on silicon substrate...for SOI structures) in view of Imai et al. (U.S. Pat. 5,847,419) as applied to claims 15 and 21 above and further in view of Setsune et al. (4,980,339).

Art Unit: 2814

Morshed teaches substantially the entire claimed structure, as applied to claims 15 and 21 above, except for the substrate comprises a germanium substrate.

Setsune et al. teach in figure 1 the substrate comprises a germanium substrate, which is effective as well as silicon substrate (column 2, lines 54-59). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to substitute the germanium substrate in Morshed's device. Because the substitution of art-recognized equivalent as suggested by Setsune in order to apply the device in a particular application is within the level of ordinary skill in the art.

14. Claims 71-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morshed et al. (Epitaxial CeO₂ on silicon substrate...for SOI structures) in view of Imai et al. (U.S. Pat. 5,847,419) as applied to claims 15, 21 and 27 above and further in view of Ami et al. (6,610,548) of record.

Morshed teaches substantially the entire claimed structure, as applied to claims 15, 21 and 27 above, except for the oxide layer crystallizes to have a bixbyite structure.

Ami et al. teach an oxide layer crystallizes to have a bixbyite structure for the purpose of epitaxially growing the rare earth oxide in the orientation more reliably (column 9, lines 12-57). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to form an oxide layer crystallizes to have a bixbyite structure in Morshed's device as taught by Ami et al. for the purpose of epitaxially growing the rare earth oxide in the orientation more reliably.

Response to Arguments

Applicant argues that Morshed does not teach or suggest “ a smooth epitaxial silicon layer comprising single-crystal silicon formed on the crystalline oxide layer”, as recited in claim 15, or “wherein the amorphous layer is deposited in the presence of a surfactant vapor, such that the amorphous layer forms a smooth epitaxial silicon layer when annealed”, as recited in claim 27. This argument is not persuasive because the single-crystal silicon layer of the prior art formed on the single-crystal oxide layer by epitaxial which is the same process as disclosed by the claimed invention (see the office action above), the epitaxial silicon layer of the prior art would inherently be smooth, it should be noted that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, claimed properties or functions are presumed to be inherent. In re Best, 195 USPQ 430, 433 (CCPA 1977). Therefore, the epitaxial silicon layer of the prior art would inherently be smooth.

With respect to claim 27, the limitations of “wherein the amorphous layer is deposited in the presence of a surfactant vapor, such that the amorphous layer forms a smooth epitaxial silicon layer when annealed” should be noted that claim 27 is not directed to any method for making a smooth epitaxial silicon layer, but rather, is directed to the resulting of the smooth epitaxial silicon layer. Therefore, the process limitation recited in claim 27 (the amorphous layer is deposited in the presence of a surfactant vapor, such that the amorphous layer forms a smooth epitaxial silicon layer when annealed) would not carry patentable weight in claims drawn to a structure because

Art Unit: 2814

these claims are directed to the product, no matter how it is actually made, and the patentability of the final product must be determined, not the patentability of the process, which in any case have not been presented in "product by process" claims. In this case, a smooth epitaxial silicon layer of invention is not different in structure comparing to the epitaxial silicon layer of Morshed.

The rest of applicant's arguments, addressed to the amended claims are considered in the rejections shown above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Art Unit: 2814

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Theresa T Doan whose telephone number is (571) 272-1704. The examiner can normally be reached on Monday to Thursday from 8:00AM - 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, WAEL FAHMY can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TD
October 15, 2004.


PHAT X. CAO
PRIMARY EXAMINER